Land and Water Boards of the Mackenzie Valley

Closure Cost Estimator for Land Use Permits

Support Manual

February 2021

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Definitions and Acronyms

TERM	DEFINITION
AANDC	Aboriginal Affairs and Northern Development Canada (now CIRNAC)
Applicant	A person who has filed an application with the Board.
Application	Any application for or in relation to a land use permit or water licence submitted in accordance with the *Mackenzie Valley Resource Management Act* (MVRMA), the *Waters Act*, or their regulations, and includes a request for a Board ruling, a plan approval, or any step required to advance a Board proceeding.
ARD/ML	Acid rock drainage/metal leaching.
ARHCA	Alberta Roadbuilders and Heavy Construction Association
Boards	The Land and Water Boards of the Mackenzie Valley, as mandated by the MVRMA. • Part 3 of the MVRMA establishes regional land and water boards with the power to regulate the use of land and water, and the deposit of waste, including the issuance of land use permits and water licences, so as to provide for the conservation, development, and utilization of land and water resources in a manner that will ensure the optimum benefit to the residents of the management area and of the Mackenzie Valley and to all Canadians. • Part 4 of the MVRMA establishes the Mackenzie Valley Land and Water Board (MVLWB). • Regional Land and Water Boards have been established in the Gwich'in, Sahtu, and Wek'èezhìi management areas and now form Regional Panels of the MVLWB.
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada (formerly AANDC/INAC)
Closure cost estimate	An estimate of the cost to close and reclaim a project. Also referred to as a security estimate.
Closure cost Estimator for Land Use Permits	An EXCEL spreadsheet for calculating closure cost for projects that require a land use permit.
CRP	Closure and Reclamation Plan.
Engagement	The communication and outreach activities a proponent undertakes with affected parties prior to and during the operation of a project.
GNWT	Government of the Northwest Territories
INAC	Indigenous and Northern Affairs Canada/Indian and Northern Affairs Canada (now CIRNAC)
Indigenous government/ organization	An Aboriginal organization representing a First Nation (as defined in section 2 of the MVRMA), Métis or Inuit organization, the Tłı̨chǫ First Nation, the Tłı̨chǫ Government, or the Délı̨nę Got'ine Government.
Landowner	In respect of settlement lands, Tłı̨chǫ lands, Délı̨nę lands, or other private lands, the title holder; and in respect of any other lands, the minister of the Crown or the Commissioner of the Northwest Territories, as the case may be, who has administration and control of the lands.[1]

[1] See section 1 of the MVLUR

Land-use operation	Means any use of land that requires a permit.[2]
Land use permit	An authorization required for an activity set out in sections 4 and 5 of the Mackenzie Valley Land Use Regulations, or a land use permit (Type C) required by Tłı̨chǫ law for use of Tłı̨chǫ lands, or by a Délı̨nę law for use of Délı̨nę lands, respectively, for which a Type A or Type B land use permit is not required.
Mackenzie Valley	That part of the Northwest Territories bounded on the south by the 60th parallel of latitude, on the west by the Yukon Territory, on the north by the Inuvialuit Settlement Region as defined in the Agreement given effect by the *Western Arctic (Inuvialuit) Claims Settlement Act*, and on the east by the Nunavut Settlement Area as defined in the *Nunavut Land Claims Agreement Act*, but not including Wood Buffalo National Park.
MVLUR	Mackenzie Valley Land Use Regulations
MVLWB	Mackenzie Valley Land and Water Board
MVRMA	*Mackenzie Valley Resource Management Act*
NWT	Northwest Territories
Permittee	A person who holds a land use permit issued by a Board.
Person-day	In respect of a campsite, means the use of the campsite by one person during the course of one day.[3]
Proponent	Applicant for, or holder of, a water licence and/or land use permit.
Project	Any activity that requires a water licence or land use permit.
QA/QC	Quality Assurance / Quality Control
RECLAIM cost model (or RECLAIM)	The preferred tool for calculating closure cost estimates for activities that require a water licence (including those that also require a land use permit). RECLAIM is specific to mining and oil and gas projects, and is administered by the GNWT or CIRNAC.
Reclamation	The process of returning a disturbed site to its natural state, or to a state which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.
Remediation	The removal, reduction, or neutralization of substances, wastes, or hazardous material from a site in order to prevent or minimize any adverse effects on the environment and public safety now or in the future.
Security deposit	Funds held by the appropriate authority (the GNWT, CIRNAC, or landowner) that can be used in the case of abandonment of a project to reclaim the site, or carry out any ongoing measures that may remain to be taken after the abandonment of the project.
Water licence	An authorization required as per Columns III and IV of Schedules D to H of the Waters Regulations (for non-federal areas) and Columns III and IV of Schedules IV to VIII of the Mackenzie Valley Federal Areas Waters Regulations (for federal areas).

[2] See section 1 of the MVLUR

[3] See section 1 of the MVLUR

1 Introduction

In the Mackenzie Valley, the Gwich'in, Sahtu, Wek'èezhìi, and Mackenzie Valley Land and Water Boards have the authority to set a security deposit for activities that require a land use permit.[4] The security deposit is intended to cover the costs to close and reclaim the site if the site were abandoned, and to carry out any post-closure measures. Subsection 32(1) of the Mackenzie Valley Land Use Regulations (MVLUR) state that the Board may require security to be posted in an amount not exceeding the aggregate of the costs of:

(a) Abandonment of the land use operation;
(b) Restoration of the site of the land use operation; and
(c) Any measures that may be necessary after abandonment of the land use operation.

The Board's authority to set security for land use permits applies throughout the Mackenzie Valley. Depending on the location within the Mackenzie Valley, Indigenous Governments, Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and the Government of the Northwest Territories (GNWT) share the authority for establishing the form of security, holding security, and where necessary for paying for the closure and reclamation of sites. Indigenous Governments, CIRNAC, and the GNWT also have the authority to set security under other instruments within their respective jurisdictions.

The Closure Cost Estimator for Land Use Permits (the Estimator) was developed to assist applicants, landowners, and authorities in calculating the closure cost amount for activities that require only a land use permit (and not a water licence). The Estimator is intended to be generic in its applicability to a range of land use operations but may be modified to account for site-specific circumstances ("Other Project Specific Costs"). Land use permit applicants must complete the Estimator and submit it with the land use permit application. If an estimate is not submitted, the application will be deemed incomplete.

As described in more detail in the Mackenzie Valley Land and Water Board (MVLWB) (2020) *Guide to the Land Use Permitting Process*, applicants should conduct engagement before submitting a land use permit application. As part of this engagement the applicant should discuss the closure cost estimate with the appropriate landowner or land manager. The Board will use the applicant's completed Estimator, the information in the application, comments and recommendations from reviewers, and any other relevant evidence to make a final determination on the security amount that must be posted under the permit.

The Estimator is populated with default unit costs for closure and reclamation activities (e.g., waste shipping and disposal costs), as described in the Estimator itself and in this document. Applicants can also enter certain project-specific unit rates, where the rates in the Estimator are not applicable. See Section 4.4 for more detail about this option.

The Estimator is the Boards' preferred method of estimating closure costs for projects that require a land use permit (and not a water licence). If an applicant does not want to use the Estimator to

[4] The Boards' authority to require proponents to post and maintain security is granted under the *MVRMA* and subsection 32(1) of the MVLUR.

estimate closure costs, the onus is on the applicant or other party to propose an alternate method prior to submitting the estimate. Requests to use a different method must be accompanied by:

1. a description of how the proposed method works;
2. a description of how the method reflects the principles in the INAC (2002) Reclamation Policy; and
3. a rationale for why a different cost estimating method is being proposed.

The alternate method should be discussed with the landowner or land manager, prior to requesting the Board's approval. If the Board approves use of an alternate method, the proponent (or reviewer, as the case may be) may then submit the closure cost estimate using the alternate method.

This Support Manual provides context for the costs included in the Estimator and user instructions for the Inputs required.

Board staff are available to assist applicants with the Estimator (see Appendix A for contact information).

1.1 Applicability

The Estimator is for land use operations that are typically small operations predominantly quarrying and mineral or oil and gas exploration, but also in forestry, transportation, communication, research, tourism and more. It is intended for land use operations that require a land use permit but not a water licence.[5] For operations that require a water licence, including projects that require both a land use permit and a water licence, RECLAIM is the preferred cost estimating model.[6] The Estimator will be used for new applications, including applications for a new permit, a renewal, or an assignment. Initially, it will not be used for extensions to permits, since costs for these projects will have been estimated using the Boards' previous security template. Similarly, for amendment applications, the Estimator will initially be used only if the amendment involves a change in the project's liability (for example, expansion of the project footprint).

The GNWT and federal governments are not required to post security. Similarly, community governments do not have to post security for a land use permit that supports a municipal undertaking. For example, a community government would not have to post security for a land use permit that allows geotechnical drilling, if the drilling is related to construction of a municipal water treatment plant. Community governments that are applying for a land use permit for other types of land use (e.g., commercial activities) or for activities that will take place outside of any local boundaries that exist, are encouraged to discuss security with the land owner or manager before submitting their application.

[5] See www.mvlwb.ca for Guide to the Water Licensing Process (2020), which outlines when water licences are required.

[6] See mvlwb.ca for GNWT - RECLAIM 7.0 Model for Estimating Reclamation Costs - User Manual: Oil and Gas Version (2017) and GNWT - RECLAIM 7.0 Model for Estimating Reclamation Costs - User Manual: Mining Version (2017).

1.2 Objectives

The Estimator was developed to achieve the following key objectives:

a) The Estimator is user friendly.

b) The Estimator captures all reasonable and expected closure and reclamation costs.

c) The Estimator provides a transparent and consistent cost estimating approach.

To meet these objectives, the information the user enters into the Estimator aligns with the information entered in the Land Use Permit Application Form (the Application Form).[7] Guidance for the application process is provided in the MVLWB (2020) *Guide to the Land Use Permitting Process.*[8] The closure and reclamation categories and activities in the Estimator are also consistent with RECLAIM and other Canadian security cost models (e.g., British Columbia Ministry of Energy and Mines and Petroleum Resources (MEMPR) Regional Reclamation Bond Calculator),[9] and accepted industry cost estimating methods are applied.

1.3 Basis and Assumptions

The security associated with an applicant's Land Use Permit is intended to cover the costs to fulfill the obligations for closure and reclamation should the site be abandoned.

The underlying basis and assumption of the Estimator are:

- Unit costs are based on third-party contractors conducting all of the work.
- Mobilization costs are included for every piece of equipment or machine required for the work to be completed (i.e., assumes equipment that was being used for the land use operation will not be available or in good working condition);
- There is no credit for salvage or sale of equipment; and
- The closure costs reflect the activities, scope, and scale detailed in the Land Use Permit Application.

Assumptions were made with input from technical experts and were informed by government experience cleaning up land use permit sites. More information on the assumptions and sources of information are documented in the Estimator.

The Estimator is generic and intended to be applicable to a range of types and sizes of land use operations. Projects that require a land use permit only and not a water licence typically have limited footprints and, therefore, limited impacts to land and water. For such operations, the removal of buildings and equipment are expected to be the most significant costs. In a northern environment, clean-up of a site,

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[7] See https://mvlwb.com/mvlwb/apply-permit-licence for the application form and supporting materials.

[8] See mvlwb.ca for MVLWB (2020) *Guide to the Land Use Permitting Process.*

[9] See British Columbia's provincial website under Mineral Exploration and Mining – Mine Permitting – Reclamation and Closure https://www2.gov.bc.ca/gov/content/industry/mineral-exploration-mining/permitting/reclamation-closure.

consolidating waste, and preparing items for demobilization would occur as a field program in an appropriate season for the work (e.g., depending on the debris and equipment to be removed, in a season with minimal or no snow-cover). If removal of large quantities of waste and/or heavy equipment is necessary, demobilization would also be seasonally dependant (e.g., frozen conditions for winter road access or dry ground conditions for summer air access) and may be carried out separately from the clean-up field program.

In addition to the above, for land use operations that require land restoration using heavy equipment, an initial mobilization would be required to bring the heavy equipment to the site. This is consistent with the underlying assumption that mobilization costs are included for every piece of equipment or machinery required for the work to be completed. The sequence is then assumed to consist of an initial equipment mobilization, a closure and reclamation field program, and demobilization of all the mobilized equipment, abandoned equipment and buildings, and waste materials and debris.

With the exception of a limited amount of soil remediation resulting from fuel spills, costs associated with remediation of contamination are not considered in the security estimate (e.g., significant reportable spills that impact water and soil). It is expected that permittees will clean up and report spills at the time they occur, in accordance the INAC Guidelines for Spill Contingency Planning[10] and standard land use permit conditions.[11] Projects with existing contamination requiring significant remediation will need to estimate those costs and enter them as "Other Project Specific Costs" in the Project-Specific Costs worksheet. Similarly, land use operations with unique activities or more complicated logistics (e.g., use of helicopters or barges) may also require site specific costs to be added in the same worksheet. This is discussed further in Section 4.4.

1.4 Phased Security

In most cases, the Boards set security as a lump sum to be posted before starting the land use operation. The Boards recognize that the completed Land Use Permit Application may describe the maximum extent of the proposed operations, and that in some cases, the full extent of the project may never be realized. In that case, the Boards will consider phasing security if requested by the applicant.

Typically, if phasing is justified, the Boards will consider two phases: a first deposit to be posted before starting the land use operation and a second deposit to be posted before hitting a predefined milestone. For the most part, the Boards will consider phasing only for projects that meet the following criteria:

- There is a clear, definable milestone that marks when the closure cost will change (for example, an increase in the cost due to construction of a large camp, borrow site, or winter road); and
- The site will not be developed to the full extent described in the land use permit application until well into the life of the permit (e.g., 2 years or more), if at all.

[10] See mvlwb.ca for INAC Guidelines for Spill Contingency Planning.

[11] For example, the MVLWB Standard Land Use Permit Conditions Template (2020) includes conditions requiring the immediate clean-up of all leaks, spills and contaminated material. Other conditions require secondary containment, a Spill Contingency Plan, spill-response equipment, etc.

Applicants are discouraged from proposing more than two phases (the initial and second deposit). This is because land use permits have a relatively short life as compared to many water licences where multiple milestones are more common. Setting several milestones in a five-year period can result in inaccurate estimates because of the many assumptions that must be made for each milestone. This could lead to frequent requests to adjust security after the permit is issued. The Boards can only adjust security during the permit term by amending the permit. To amend a permit, the permittee must submit a new amendment request to initiate a public proceeding. The review of numerous estimates and milestones, and the potential for multiple land use amendment proceedings in the five-year term of a permit would place significant burden on reviewers, regulators, Landowners and land managers.

When proposing phased security, applicants should submit the following:

- A robust rationale for why security should be phased;
- A clear explanation of the proposed milestone;
- A completed version of the Estimator for the closure cost for the entire project;
- A completed version of the Estimator for each of the following:
    1. The initial security deposit to be posted before starting the land use operation and
    2. The second security deposit, to be posted before the milestone is reached; and
- Supporting documentation for the closure cost estimate of each phase. This can be in the form of additional versions of the completed Estimator (one for each phase) or a written description of how the cost for each phase was calculated.

Applicants should contact Board staff in advance if they plan to propose phased security.

1.5 Form of Security

For land use permits, security must be provided in a form acceptable to the Minister before activity can begin. For both the GNWT and Government of Canada, the preferred forms of security are cash and irrevocable letters of credit (ILOCs). Preferred forms can be reviewed and accepted within a few days. Other forms of security may require longer and more in-depth review. Applicants should plan ahead to avoid potential project delays. For further details for projects on public land, applicants can contact the GNWT Department of Lands. For further details for projects on federal land, applicants can contact CIRNAC – Northwest Territories Regional Office. See Appendix A for more detailed contact information.

1.6 Overlap with GNWT Land Tenure Instruments

Some land use permit applicants may also need to apply for a land tenure instrument (for example, a land lease) with the GNWT. In some cases, the GNWT may advise proponents to submit land use permit applications and land tenure applications at the same time and to synchronize the content of these applications. This could happen when a project is complex and/or of long duration and could potentially

impact other tenure-holders, landowners, and land-users. Synchronization could also be required for projects involving development of a transportation corridor. Contact the Department of Lands Territorial Land Administration division for further information (see Appendix A for contact information).

2 User Instructions

2.1 Structure of the Estimator

The Estimator is in MS Excel file format and consists of two user entry worksheets and four calculation worksheets, which are displayed for transparency.

User entry worksheets:

1) Costing Questions
2) Project-Specific Costs

Calculation worksheets:

3) Closure Costs
4) Quantities Worksheet
5) Activity Rates Worksheet
6) Unit Rates Worksheet

User-provided information (data entry) is only required for the Costing Questions worksheet. Input for project-specific costs is optional for projects with special circumstances or who seek greater flexibility. It is expected that the Project-Specific Costs worksheet will not be necessary for most projects. The Closure Costs worksheet is a summary and breakout of the total closure cost by reclamation activities. The three other calculation worksheets show details of the costing methodology.

2.2 Costing Questions Worksheet

The Costing Questions worksheet is where applicants enter most of the information needed to calculate the total closure cost. For the most part, the instructions are embedded in the Estimator. For ease of use, the order and numbering in this worksheet match the items of the Application Form. Items of the Application Form that do not affect security calculations have not been included in the Costing Questions worksheet.

The column headings in the Costing Questions worksheet include the following:

- Question No. — Questions 1 to 18;
- Reference — This reference is to the item number on the Land Use Permit Application Form where the information can be obtained, as well as to specific sections from the MVLWB (2020) Guide to the Land Use Permitting Process.;

• Costing Question	Describes what information should be entered;
• Enter Your Answer	There are 18 questions for the user to answer, which are highlighted in yellow. Eleven (11) are 'quantities' and seven (7) are 'yes or no' entries. The answers are used in the calculation worksheets to calculate the closure cost;
• Reference to Calculation Worksheets (WS)	This reference is to the closure cost activity number, which relies on the answer to that question. The answer is used in the Quantities or Activity Rate worksheets to develop the closure cost estimate for the referenced activity(ies);
• Applicant's Rationale for Answer	Section where the user provides the rationale for their entry.

Under the Total Closure Cost box at the top of the sheet, italicized text shows the number of questions (out of 20) completed. All questions must be completed to properly calculate the closure cost.

3 How are Individual Costs Calculated?

The Estimator uses the answers from the Costing Questions worksheet to calculate cost quantities and activity rates for each of the different cost items. The calculated quantities, work effort estimates, activity rates and established unit rates are all incorporated into the Closure Costs worksheet, which provides a breakout of the total closure cost estimate for the project. Because the calculation worksheets are all closely linked, the cost categories (e.g., cost category 1 – Land Restoration) are the same in each. The Unit Rates worksheet provides a summary and detail for all the unit rates used in the Estimator.

The Quantities worksheet and Activity Rates worksheet have a 'Costing Detail' column (Column "G"), which provides information breakdowns for each row. The next set of columns (Columns "I" to "N") are used to calculate the appropriate Quantity or Activity Rate for a given row (each row being equivalent to a reclamation cost item/ activity). These cells contain different variables so calculation formulas can be tracked and followed in the worksheet. The variables include:

- True or false logic formulas that trigger specific cost items
- Input dimensions
- Formulas for converting quantities to match the final costing quantities
- Results from other calculation rows
- Assigned values
- Derived production rates (daily production rates)
- Daily unit rates
- Formulas for quantity unit rates

Columns “P” and “Q” of the Quantities worksheet and Activity Rates worksheet have the calculated quantities and activity rates.

The Quantity Worksheet also has an additional set of columns, “T” to “V”, which display the work production formulas and calculated production rates.

Descriptions of the calculations for the different reclamation activities (grouped by Cost Categories) are provided in the sections below.

3.1 Land Restoration

The Estimator uses the total number of hectares to be used in each phase of the project (entered by the user), to calculate land restoration costs, if required. If your project will be using heavy equipment for operations (as indicated on the Application), it is expected that heavy equipment will be required at closure to restore disturbed work areas. For purposes of the Estimator, disturbed work areas are those that are impacted directly from project activities and require some sort of active restoration to return the area to an acceptable condition. The Estimator includes the costs of restoring these areas (as described in the next paragraph) and assumes that 15% of the total hectares used would be revegetated. This assumption accounts for practical and fiscal constraints on revegetation and the fact that some used areas may not have had vegetation before the disturbance. The Board or landowner may require additional land restoration, in which case the user will need to enter additional land restoration costs in the Project-Specific Cost worksheet (in one of the Other Project Specific Costs rows).

Common restoration activities using heavy equipment may include the following:

- Re-contouring disturbed areas
- De-compacting surfaces (e.g., ripping or rough and loose surface preparation)
- Placement of stockpiled topsoil
- Stabilization of landforms, including erosion control measures
- Reclamation of site access roads

Examples of project components constructed by heavy equipment that typically require heavy equipment for restoration:

- underground portals
- large fuel storage containment cells & containment berms
- earth moving or land clearing excavations, stockpiles, quarries & drainage channels
- access roads & airstrips
- large areas where topsoil or vegetation was removed
- building foundations and demolition of large buildings

Typically, mobilization of heavy equipment is not required for the following project components:

- seismic lines
- drill pads (unless vegetation or topsoil was removed with machinery)
- camp pads, camp sumps, camp drainage areas
- laydown area pads
- skidder trails
- small areas where topsoil, vegetation, or trees were removed by hand

If land restoration is required, the assumed heavy equipment fleet would include:

- One 20-tonne excavator
- Two 30-tonne haul trucks
- One D6 bulldozer

- Quantities: The Estimator uses the total area in hectares (ha) of used land to assess the total work effort required.

  A default of 15% of the total area is assumed in the calculation for the quantity of material for placement of organics (e.g., stripped and stockpiled soil) to restore specific areas and promote re-vegetation. 15% is considered a reasonable coverage of disturbed work areas and assumes available and salvageable topsoil is limited.

  The application of fertilizer and seed is also based on 15% of the total land used.

- Production: The overall production rate (duration) of the work is dictated by the productivity of bulldozing;

  - At a rate of 300 loose metres^3/hour (Caterpillar Performance Handbook[12]),
  - Or 1.9 hectare/day.

  It was determined that the bulldozer would be at full production for the duration of the reclamation work and excavator and two haul trucks at one third production for the same duration.

  Assuming a 200-metre haul, the production for the placement of salvaged topsoil was calculated to be 880 m^3/day.

[12] A publication by Caterpillar, Peoria, Illinois, U.S.A. Performance information in the booklet is intended for estimating purposes only.

Based on a four-person crew, application of fertilizer and then seeding could each be done at two hectares/day (based on the BC Bond Calculator).[13]

- Unit Rates: The unit rates for this work are based on the calculated daily productions and the daily rates for the equipment fleet and labour crew.

3.2 Removal of Abandoned Equipment and Buildings

The basis of the closure cost estimate is that all Buildings and Equipment will be removed from the site, as opposed to considering these to be an asset that will remain. Note that this section is not about demobilization costs, which is addressed separately (see Section 3.5).

Costs for removing abandoned equipment and buildings are calculated as follows:

- Quantities: The closure cost includes costs for labour to prepare the abandoned equipment (including removal of hazardous materials such as lubricants and oils) and demolish the buildings for winter demobilization, including clean-up of and consolidation of all scrap and debris.

  The calculations are based on the user entries for total number of pieces of equipment, area of land used (for scrap cleanup), and the total area of buildings (for manual dismantling and demolition).
- Production: Production rates for the labourers to prepare equipment, pick up scrap and dismantle buildings are assumed based on typical practice at abandoned sites.
- Unit Rates: The unit rates for this work were derived from the calculated daily productions and the daily rates for the equipment fleet and labour crew.

  Tipping unit rates are based on a reputable vendor quote.

3.3 Management of Hazardous Materials and Contaminated Soil

Costs in this category are for residual fuel and fuel container management, and the removal and disposal of a limited quantity of contaminated soil as has typically been observed at abandoned sites. A small amount of hazardous waste and hazardous building materials would also be collected, consolidated, and disposed of, including:

[13] See British Columbia's provincial website under Mineral Exploration & Mining – Mine Permitting – Reclamation and Closure https://www2.gov.bc.ca/gov/content/industry/mineral-exploration-mining/permitting/reclamation-closure.

- Waste petroleum products such as oils and lubricants (including residual volumes from abandoned equipment), filters, absorbent pads
- Used chemicals (cleaners and other solvents)
- Batteries
- Fluorescent lights

As stated in Section 1.3, more extensive contamination of soil or water is not considered in the Estimator and if present would require a calculation outside of the Estimator.

Costs for removing hazardous materials and contaminated soils are calculated as follows:

- Quantities: The total volume of fuel that will be on the site at any one time is used to determine the work effort for a crew to clean and consolidate the empty fuel containers. It is also used to estimate a residual amount of waste fuel that will require removal and disposal. It is not the total volume of fuel that is used in the closure cost estimate; only a residual quantity calculated as a percentage of the total.

  The soil remediation volume is also based on an assumed percentage of the total fuel volume that may be absorbed into the soil. This assumption is based on typical conditions at abandoned sites.

  Disposal of hazardous materials includes the weights of drums and fuel tanks, contaminated soil, waste fuel and waste petroleum products. The waste fuel represents a 10% estimated residual of the total permitted fuel volume.
- Production: Production rates for the labourers to drain residual fuel and consolidate the fuel containers, as well as remove contaminated soil manually, are based on reasonable industry estimates.
- Unit Rates: The unit rates for this work are based on the calculated daily production and the daily rates for the equipment fleet and labour crew.

  Tipping unit rates are based on a vendor quote.

3.4 Interim Care and Maintenance

Interim care and maintenance occurs during the period of time after the site has been abandoned and before closure and reclamation activities have been initiated. It is expected that most operations that require only a land use permit will require little interim care and maintenance. The Estimator includes a cost for a site inspection to assess and, if necessary, secure the site and evaluate reclamation

requirements. These costs are included for all projects, regardless of scope and size. However, if potential environmental impacts to either land or water are triggered by an Input of 'Yes' to Questions 14 and 15, then costs are also included for geotechnical inspections and water monitoring.

3.5 Mobilization, Camp, and Demobilization Costs

The Estimator includes the cost category Mobilization, Camp and Demobilization Costs. Within this cost category are the following subcategories:

a) **Heavy Equipment Mobilization:** If heavy equipment is required for land restoration, then costs for an initial equipment mobilization are triggered. The four pieces of heavy equipment outlined in Section 3.1, supplies, and calculated fuel would be mobilized to the site. If winter road construction is required, associated costs are also included.

b) **Workers and Supplies Mobilization:** It is assumed that the majority of closure and reclamation activities would be carried out during a single field season. Such activities would include site cleanup, waste consolidation and preparation for demobilization, building dismantling, etc. By default, the Estimator includes costs for mobilization of crew and supplies, a field work program, and demobilization.

c) **Camp Mobilization:** Camp costs include accommodation and meals, based on the number of person-days. The clean-up field program is based on the quantity of work and calculated work production rates, which are used to calculate the persondays. For a program less than one week, it was determined daily fly-ins to site would be more cost effective than using a camp. A formula assigns either additional daily mobilization and demobilization for this scenario, or for total number of workdays in excess of one week, camp supply costs are triggered.

d) **Demobilization of Abandoned Equipment and Reclamation Equipment:** The demobilization includes all reclamation equipment, abandoned equipment, consolidated building wastes, and consolidated hazardous wastes.

Costs for mobilization, camp and demobilization are calculated as follows:

- Quantities:

  If required, the initial mobilization would include equipment, supplies and fuel based on weights of the determined reclamation equipment fleet. Fuel is calculated based on the quantity of work, activity production rate of the equipment and calculated fuel consumption of the equipment.

  The field program mobilization assumes a six-person crew (one supervisor, four labourers and one camp/support person). A provision for four operators is added for when heavy equipment is required. Costs include mobilization of a six or ten-person camp and then full demobilization of crew and camp.

  Camp quantities are based on calculated person-days.

The final demobilization quantities are drawn from the other user entries:

- Reclamation equipment weight
- Abandoned equipment weight (equivalent to total equipment to be used during the land use operation)
- Abandoned buildings weight
- Hazardous material weight

- Unit Rates: For hauling waste, the Estimator calculates a land mobilization/demobilization unit rate per tonne based on haul truck and driver hourly rate, return distance from site to the support city and speed of travel.

  It calculates an air (fixed-wing) mobilization/demobilization unit rate per tonne based on the aircraft charter hourly rate, return distance of site to the support city and speed of travel.

See Section 3.11 for information about the contingency percentage added to mobilization and demobilization costs.

3.6 Development of a Detailed Closure and Reclamation Plan

The Land Use Permit Application Form item 18 requires a description of the plan for closure and reclamation. Applicants are to develop a CRP to address the cleanup at the site and any impacts to the land. If there is reasonable certainty in the Closure and Reclamation Plan, and no additional technical or further design requirements are expected, significant costs for a Closure and Reclamation Plan would therefore not be expected.

For large or complex projects, projects where there is significant uncertainty regarding closure, or projects where additional design is required. a more detailed CRP is likely required, the user would input 'Yes'. This triggers costs to prepare the plan, carry out consultation and engagement, and meet regulatory compliance (e.g., permitting, reporting, legal, etc.).

3.7 Post-Closure Monitoring and Inspection

Post-closure monitoring and inspection costs should reflect the monitoring and inspections identified in the CRP. For most land use only operations, post-closure monitoring and inspection are not expected. However, a cost can be developed in the Project Specific Items worksheet should there be reasonable expectations for post-closure monitoring and inspection. More detail on this topic can be found in the instructions in the Estimator for Question 14.

Common monitoring programs include surface water quality, geotechnical, and vegetation. Other monitoring programs may be included to reflect the approved closure objectives for a particular

operation. Commonly, post-closure monitoring is conducted on a declining frequency at progressively fewer sampling points.

3.8 Project Management

Project management covers general project coordination, accounting and project control, quality assurance/quality control (QA/QC) and oversight, change orders and as-built reports. Project management is assumed to be at least 5% of direct project costs.

3.9 Health and Safety Plans/Monitoring and Quality Assurance/Quality Control

The inclusion of costs for workers health and safety, monitoring and QA/QC are common in government contracting processes and as such are relevant to the estimate of security cost. A provision of 1% of direct costs provides for preparation and administration of safety protocols, and relevant worker training.

3.10 Bonding/Insurance

Bonding and insurance are typically required for large public construction projects (e.g., projects over $500,000). Contracts for these projects typically require the contractor to furnish both a performance bond and a labour and materials bond. A formula was set up in the Quantities worksheet to trigger 1% of the direct costs for bonding if the direct costs are greater than $500,000.

3.11 Contingency

A contingency is added to cover both the uncertainty in the costing estimate (i.e., variability in quantity of work, unit costs and required scope of activities) and the possibility that some aspects of the closure and reclamation activities may be more difficult to perform.

The Estimator assigns 15% of direct project costs (Cost Categories 1, 2, 3 and 4 in the calculation worksheets) as the general contingency, which would typically be low for projects at early design stages (i.e., forecast closure and reclamation as represented in the Estimator). However, this reflects that the closure and reclamation of the land use operations are expected to have low technical design needs (e.g., simple debris and scrap clean-up, removal of equipment and buildings, demobilization) and therefore correspondingly lower risks of technical uncertainties.

The application of contingency to "Indirect" project costs varies in cost estimating practice. Since "Mobilization, Camp and Demobilization" (Indirect cost - Cost Category 5) can represent a significant amount of the total security for northern remote projects, and environmental and logistical conditions subject to change year to year, a contingency has been applied to capture cost uncertainties that could impact the final closure cost. A 10% contingency is used here to reflect a more detailed understanding of the demobilization plan (for the reclamation work) since its expected to be same as the applicant's land use mobilization plan.

The indirect contingencies do not overlap with the general 15% contingency applied to the direct costs.

4 Supporting Information

The Unit Rate worksheet lists labour rates, equipment rates, sub-contractor rates, and project costs. Each of these is discussed below. See the Unit Rate worksheet for additional information on data sources and references.

4.1 Labour Rates

The labour rates selected for the Estimator are from the Yukon Fair Wage Schedule (2020) with a loading of 200% to account for overhead, payroll, overtime, and profit.[14] The fair wage schedule was developed as a right to fair wages and working conditions on construction projects under federal contract, and was guaranteed under the *Fair Wages and Hours of Labour Act* and Regulations. Although the Act and Regulations were repealed in 2014, the Yukon continues to publish yearly wage schedules.

The Yukon Fair Wage Schedule was used since the information represents a published and current database of rates for work in northern Canadian communities. There is no published and current source of wage rates for the NWT.

4.2 Equipment Rates

Three (3) sets of equipment rates are shown in the Unit Rate worksheet, sourced from:

- The RECLAIM cost model (2014 unit costs inflated to 2020 real dollars);
- Yukon Third Party Rental Rates for government contracts (2019 rates inflated to 2020 real dollars); and
- The Alberta Roadbuilders & Heavy Construction Association (ARHCA (2020).

All three equipment rates are provided in the Estimator for context and comparison. No such database is known to exist for the Northwest Territories. For the purposes of this Estimator, the Yukon Third Party Rental Rates were selected to represent work in northern Canadian communities.

4.3 Sub-contractor Rates

- Mobilization haul: The Yukon Third Party Rental Rate has rates for tractor haul trucks and was equivalent to a vendor quote sourced in the development of this Estimator. Average travel speeds on winter roads (winter mobilization) and a typical payload are included in the variable

[14] See https://yukon.ca/en/fair-wage-schedule-2020 to download the Yukon Fair Wage Schedule.

	columns to allow calculation of per unit winter road mobilization rates.
• Twin Otter:	A vendor quoted rate for a Twin Otter charter, travel speed and payload are in the Variable columns to provide data for calculating per unit air mobilization rates.
• Camp rental rate:	A vendor quote is listed in the variable column.
• Operation of camp:	An estimate based on known camp costs is listed in the variable column.
• Waste disposal tipping fee	The Estimator was initially set-up to cost disposal transport and tipping fees separately. As the Estimator was further developed, a vendor quoted rate for tipping at a waste transfer facility was determined to be appropriate for the industrial waste disposal. The quoted tipping fee included transport and final disposal to a licensed disposal facility.
• Hazardous waste disposal tipping fee; contaminated soil	A vendor quoted rate for disposal at a waste transfer facility is used for the contaminated soil disposal
• Hazardous waste disposal tipping fee; liquid	A vendor quoted rate for tipping at a waste transfer facility is used for the liquid hazardous waste disposal.

4.4 Project-Specific Costs

The optional Project-Specific items worksheet allows the user to override some of the default costs in the Estimator, for example unit rates for project access and winter road construction, geotechnical inspections and water quality monitoring, engagement and regulatory compliance and more. For each entry in the Project-Specific Costs sheet, applicants must submit the following documentation with the security estimate:

a) an explanation of why the default cost in the Estimator does not apply; and

b) supporting calculations and documentation, including evidence that the site-specific cost represents third-party contractor costs. If a site-specific cost is based on confidential information (e.g., contractor bids), the Board can consider accepting confidential information as outlined in the Board's Rules of Procedure.

When both requirements (a) and (b) are met, the Boards will consider whether the proposed site-specific cost is appropriate. Site-specific costs that heavily impact the security estimate should be discussed with the landowner (Indigenous Government, GNWT, or CIRNAC) prior to submitting them to the Board. As noted above, site-specific unit costs must reflect third-party contractor costs, not the costs that would be incurred if the proponent conducted the work.

4.4.1 Project Location Access – Unit Rate (Item A)

For land accessible remote locations, the costs for demobilizing the abandoned equipment and wastes are based on transport trailer hauling rates. If there is no land access, the Estimator assumes air-access is by fixed-wing aircraft for demobilizing the abandoned equipment and wastes. If the project uses another primary method for location access (e.g., helicopter-only or barge), a Project-Specific unit rate can be entered in the worksheet. (Project-Specific Cost Item A).

4.4.2 Winter Road Construction – Unit Rate (Item B)

The default unit rate for winter ice road construction was based on the upper end of the range in the RECLAIM model for this type of road, adjusted for inflation (since RECLAIM was last released in 2014). The upper end of the range was used based on input from technical experts and government experience regarding likely costs for this type of road construction. The rate represents a significant cost for any closure cost estimate and is recognized to be highly variable. A simple per distance unit rate may be too simplistic to accurately assess the costs; however, a more sophisticated estimate is beyond the scope of the Estimator. Therefore, a project-specific unit rate can be entered in the Project-Specific Costs worksheet. Where possible, actual costs from the applicant's planning or operations should be used and adjusted as necessary to reflect third party costs. Applicants should provide supporting rationale and if possible, supporting documentation.

4.4.3 Interim Care and Maintenance (Geotechnical Costs (Item C) and Monitoring Costs (Item D)) and Post-Closure Monitoring (Item H)

Cost for monitoring and inspection were used as defaults in the Estimator. The costs were estimated based on experience with small-scale monitoring and inspection projects. However, it is recognized that the scope of the work will highly influence costs, and a large database for the types of land use operations intended to be represented in this Estimator is not available.

For monitoring and geotechnical inspection costs, the user can enter the following:

- Number of inspections per year
- Cost of contractors for each inspection
- Laboratory costs
- Reporting costs
- Other costs
- Number of years

4.4.4 Costs for Engagement (Item E), Regulatory Compliance (Item F) and Detailed Closure and Reclamation Plan (Item G)

Engagement costs, regulatory compliance costs and detailed CRP costs can also be entered as project-specific costs. The Estimator includes default costs for these items; however, the user can enter project-

specific costs if the defaults are not appropriate. Rationale and supporting documentation must be submitted.

4.4.5 Other Project Specific Costs (Item I)

Costs that are unique to the project can also be added in the "Other Project-Specific Costs" section at the bottom of the worksheet. These are costs not anticipated by the Estimator, and they must be calculated by the user before they are entered.

APPENDIX A – CONTACT INFORMATION

For more information, please contact:

Land and Water Boards

Gwich'in Land and Water Board
www.glwb.com 867-777-4954

Mackenzie Valley Land and Water Board www.mvlwb.com
867-669-0506

Sahtu Land and Water Board www.slwb.com
867-598-2413

Wek'èezhìi Land and Water Board
www.wlwb.ca 867-765-4592

Government of the Northwest Territories

Securities and Project Assessment Division
Department of Lands
Government of the Northwest Territories
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